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ABSTRACT

A program involving two experimental fifth-grade groups, one of 15 boys, the other of 15 girls, used specifically developed instructional materials to capitalize on the different interests and characteristics of boys and girls and to determine the effect of sexual segregation on their achievement in language arts and science. A third experimental, mixed group also utilized team teaching and a wide range of new equipment, but the material was not designed specifically to interest either sex. Results were compiled by pre- and post-testing the students in the three experimental groups and in three control counterparts which had covered the same basic curricular areas in a traditional classroom setting. The "All Boys" and "All Girls" experimental groups made significantly greater gains than the mixed group or the control groups in both language arts and science. Within the experimental single-sex groups, boys still tended, as in non-segregated classrooms, to achieve at a higher level in science, and girls to achieve at a higher level in language arts. (The document includes outlines of the curriculum studied by the experimental groups, as well as test results, some participant reactions, and other related research findings.) (MF)

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SEX IDENTIFICATION AS A VARIABLE IN THE TEACHING OF ENGLISH AND SCIENCE AT THE FIFTH GRADE LEVEL

F I N A L R E P O R T

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August 1968

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VI. INTRODUCTION

A. Statement of the problem

The following observations, made by those involved in the instruction of pupils at Edward Smith School and cited in most of the research published over the past 30 years as true of elementary school students in general, bring into focus the particular problem under consideration:

a. Boys assume greater leadership in experimental, manipulative phases of a science curriculum.

b. Conversely, girls tend to shy away from becoming actively involved in science experimentation.

c. Boys tend to be less verbal and less responsive in the standard English classroom.

d. Girls tend to surpass the boys in the English area, particularly in vocabulary and composition skills.

It is this differentiation of interests and abilities which presents special instructional problems at the elementary level, particularly in grades four through six. This then, is the major problem under consideration within this report.

B. Review of the Literature

There is a wealth of published research pointing up this differentiation of interests and abilities by sex role. Studies by Foster (1930), Vance, et al (1934), Honzik (1957), and Rosenberg (1960),all involve game choice as an index of Sex Typed Standards for behavior. The major results indicate that boys show an increasing preference for sex appropriate games with age. As early as 3 years of age boys are aware of many of the activities and objects that our culture regards as masculine. Among girls, however, preferences are more variable up to nine or ten years of age when their interests become less and less masculine. It appears that at this age a clear separation between male and female role identification begins a process of crystalization.

It is for this reason that grade 5 has been selected for experimentation with instruction centered around sex identification.

Early studies by Douglass (1937), Judd (1916), and Edmiston (1943) indicate that girls receive significantly higher grades in all school subjects than do boys. Clark (1952) found that girls achieve higher than boys at grade eight on mechanics of English and spelling. Girls achieved higher

at grade five on spelling as well.

Gates (1961) studied the achievement of over 12,000 boys and girls from grades two to eight on each of the Gates Reading Survey Tests speed of reading, reading vocabulary, and level of comprehension. In twenty-one comparisons the mean raw scores for girls were significantly higher than those for boys. The girls were superior in grades three and four and maintained this superiority through grades seven and eight in these three areas. It would appear, then, that differences in maturity could not be used as the sole explanation for the girls' superior performance because they were superior in both the upper and lower grades.

Robinson (1962) studied the reading achievement of boys and girls in grades one through twelve on the Gray Oral Reading Test and found that the girls' mean scores exceeded those of boys at every grade level except eleven where the boys were slightly superior. In terms of this study, the differences in mean scores of boys and girls were greatest at grades five, seven, eight, and nine.

Schinnerer (1944), in a comparison of four subject areas, English, mathematics, social studies, and general science, found the ratio of boy failures to girl failures was highest in English.

In a review of 26 studies done in this area, Oetzel (1962) found 23 of these studies to show girls significantly higher in language development, fluency and vocabulary whereas boys appeared consistently higher in the areas of reasoning and spatial ability.

In G.A. Miltons' recent review of "Five Studies of the Relationship Between Sex Role Identification and Achievement in Problem Solving" he states that "most of the research indicates that there is a sex difference in problem solving (boys tend to be more analytical and logical). However, girls scored much better when verbal problems dealt with feminine content."

Milton also points out that most studies indicate that girls are superior to boys academically in nearly all areas in the early grades and inferior gradually during adolescence.

This is seen by many as not so much of a "developmental shift" as a reflection of the fact that in general, elementary schools are feminine and high schools are masculine.

McCarthy (1952) (1953) offers the following explanation for a girl's early advantage in language development: "she has more access to common interests with the mother than a boy has."

Flather (1950) in his unpublished dissertation at the University of Washington found that in elementary schools, girls surpassed boys in science achievement because of their "book work" interest. However, when these same children were followed into junior high school, the "masculine appeal" of science spurred the boys on to a definite and significant margin of superiority.

Thomas Lyles (1966) conducted a study, "grouping by Sex", in which 310 fourth grade pupils were taught in ten classes separated by sexes, while 197 were taught in mixed classes. The results showed that the boys in separate classes made somewhat better progress, although not statistically significant in language arts and math. Their progress was better at the end of the second year than at the end of the first year.

The girls in the experimental class did not maintain the level of comparative superiority shown at the end of the first year. As measured by objective tests, the boys benefited more from the program academically than the girls.

Although not measured statistically, more positive attitudes on the part of boys were discernable, as evidenced by better behavior, attendance, cooperation work habits and participation. Boys also seemed to express themselves more freely in the language arts area, and did more experimenting in science.

Grambs and Waetzen (1967) did a study of curriculum practices "Being Equally Different" and concluded that no school systems seem to do a carefully planned job of basing curriculum content and grouping procedures on sex differences.

This lack of systematic or careful grouping by sex, as noted by Grambs and Waetzen, is reflected in the lack of published research on the results of such grouping. While the journals abound with studies showing the significance of sex differences in school achievement - relatively little has been published on the effects of a program similar to the one reported in this paper. The studies that do exist deal mainly with high school or junior high school. The study by Lyles (above) is one of the few to deal with this problem at the elementary level.

C. Program Objectives

1. General Goals

a. To determine the effect of sexual segregation on the achievement of boys and girls in English and Science.

b. To capitalize on the different interests and characteristics of boys and girls.

c. To provide an environment where each student is given the opportunity to do his own experimenting and discovering.

d. To share materials and techniques through team planning.

e. To provide the framework for unlimited progress.

f. To stimulate an interest in writing and literature by pursuing the special interests of boys and girls.

g. To use the individual teacher's strength to advantage, varying roles and using different methods of flexible grouping.

h. To provide the framework for using community resources as an integral part of the program.

i. To provide time for teachers to spend in individual and small group instruction.

j. To provide time for team planning through the scheduling of teacher aides.

k. To determine the practicality of modifying an older building to meet the demands of modern teaching.

2. Expected Outcomes

EO_1: The Experimental group, as a whole, will make significantly greater gains in Language and Science Achievement than their control counterparts.

EO_2: There will be no significant difference between the Experimental Boys and Experimental Girls groups in Language and Science Achievement growth.

EO_3: The Experimental Boys and the Experimental Girls Groups will each make significantly greater gains in Language and Science Achievement than their control counterparts.

EO_4: The Experimental Boys and Experimental Girls Groups will make significantly greater gain than the Experimental Mixed Group.

VII. METHOD AND PROCEDURES

A. The following is a definition of the subjects involved in the investigation:

1. Experimental Boys Group - 15 Males who were part of an all boys class and received their instruction in Language Arts and Science within that class.

2. Experimental Girls Group - 15 Females who were part of an all girls class and received their instruction in Language Arts and Science within that class.

3. Experimental Mixed Group - 15 Males and Females who were part of a class comprised of both boys and girls and received their instruction in Language Arts and Science within that class.

4. Control Boys Group - 15 Males, matched with their experimental counterpart, who were placed in a regular classroom not involved in the experiment.

5. Control Girls Group - 15 Females, matched with their experimental counterpart, who were placed in a regular classroom not involved in the experiment.

6. Control Mixed Group - 15 Males and Females, matched with their experimental counterpart, who were placed in a regular classroom not involved in the experiment.

B. Educational Treatments*1

1. The three treatment (experimental) groups received the following special instruction in Language Arts and Science:

   a. The "Experimental Boys" group received special instruction in Language Arts and Science which was designed to appeal to the specific sex typed interests of the group.

   b. The "Experimental Girls" group received special instruction in Language Arts and Science which was designed to appeal to the specific sex typed interests of the group.

   c. The "Experimental Mixed" group, while not receiving specific sex typed interest oriented material, did enjoy the benefits of team teaching, new classrooms, and a wide range of new equipment and materials.

2. The three control groups received no special instruction in Language Arts and Science. Certain controls were established, however, to insure that these groups were exposed to the same basic curricular content for approximately the same lengths of time as their experimental counterparts.

*1A more detailed presentation of the various treatments and activities associated with the instruction of the experimental groups appears in outline form as an appendix item. (Appendix item A-1)

C. Instrumentation

The following is a listing of the instruments utilized to obtain measures of the variables considered in this investigation:

1. Chronological Age - Data from cummulative folders.

2. Intelligence - Total IQ factor from an administration of the Lorge Thorndike Intelligence Test.

3. Language Arts Achievement - Total Language factor from the Iowa Test of Basic Skills (Pre Test - Form 1; Post Test - Form 4).

4. Science Achievement - Science subtest of the Metropolitan Achievement Test (Pre Test - Form Am; Post Test - Form Bm).

D. Technical Description of Procedures Used for Data Analysis

1. Matching - all groups were matched on chronological age, IQ, and initial levels of achievement in Science and Language Arts. Because of the relatively small number of subjects in the total population, it was impossible to match on an individual for individual basis. Therefore, all matching was done on a group mean for group mean basis across all four variables.

2. Analysis of growth - Differences between Pre and Post Testing for each subject for both Language and Science were computed. These score values (achievement growth in months) were treated in the following statistical manner to determine the significance or non-significance of all comparisons hypothesized:

   The overall experimental effects (main effects) will be analyzed within a fixed effects, 2 x 3 factorial design. The three levels of the column factor are set to reflect the three levels of sex typed grouping (All Boys, All Girls, and Mixed Grouping). The two levels of the row factor represent the experimental and the control conditions under which the experiment was run.

   Following the above test for main effects in both Science and Language Arts, Duncan's New Multiple Range Test will be run to analyze the significance of all possible between group comparisons for both Science and Language Arts.

   Duncan has developed this test to meet the need for a sound method of making comparisons among means, particularly when such comparisons tend to be non-orthogonal. Essentially, Duncan's approach to this problem is the development of a method which calls

D. 2. Analysis of growth (cont'd)

for a set of significant differences of increasing size, the size to depend on the closeness of means after ranking, with the smallest value for adjacent means and the largest for the extremes.

The use of both the 2 x 3 factorial analysis and Duncan's New Multiple Range Test should provide a valid analysis of the extent to which we have observed the expected outcomes set forth in Section VI, C2.

VIII. RESULTS

A. ANOVA Tables

The following is a tabulation of the results of the 2 x 3 analysis for Science and Language Arts:

Table 1. ANALYSIS OF VARIANCE - SCIENCE

EXPERIMENTAL AND CONTROL CONDITIONS OF SEX TYPED GROUPING FOR INSTRUCTION (ACHIEVEMENT GROWTH IN MONTHS)

Source	df	SS	MS	F
Rows (conditions)	1	786.18	786.18	4.20*
Columns (Sex type)	2	526.03	263.02	1.26
Interaction	2	101.35	50.68	0.27
Error	84	15,720.60	187.15	

*Significant at the alph = .05 level.

Table 2. ANALYSIS OF VARIANCE - LANGUAGE ARTS

EXPERIMENTAL AND CONTROL CONDITIONS OF SEX TYPED GROUPING FOR INSTRUCTION (ACHIEVEMENT GROWTH IN MONTHS)

Source	df	SS	MS	F
Rows (Conditions)	1	547.11	547.11	10.91**
Columns (Sex type)	2	143.50	71.75	1.43
Interaction	2	164.89	82.45	1.64
Error	84	4,211.00	50.13	

**Significant at the alpha = .01 level

B. Multiple Comparisons

The following is a tabulation of the results of the application of Duncan's method of comparing all treatment means for Science and Language Arts:

Table 3. DUNCAN'S NEW MULTIPLE RANGE TEST APPLIED TO THE DIFFERENCES BETWEEN 6 TREATMENT MEANS OF SCIENCE ACHIEVEMENT

		Cont. Mixed	Cont. Girls	Exp. Mixed	Cont. Boys	Exp. Girls	Exp. Boys	Least Significant Ranges
	MEANS	0.46	2.40	3.46	3.80	9.13	11.80	
Control-mixed	0.46		1.94	3.00	3.34	8.67	11.34	$R_2 = 4.22$
Control-girls				1.06	1.40	6.73	9.40	$R_3 = 4.43$
Exp.-mixed					0.34	5.67	8.34	$R_4 = 4.57$
Control-boys						5.33	8.00	$R_5 = 4.68$
Exp.-girls							2.67	$R_6 = 4.76$

Cm Cg Em Cb Eg Eb

Any two treatment means not underscored by the same line are significantly different.

Any two treatment means underscored by the same line are not significantly different.

Table 4. DUNCAN'S NEW MULTIPLE RANGE TEST APPLIED TO THE DIFFERENCES BETWEEN 6 TREATMENT MEANS OF LANGUAGE ARTS ACHIEVEMENT

		Cont. Girls	Cont. Boys	Cont. Mixed	Exp. Mixed	Exp. Boys	Exp. Girls	Least Significant Ranges
	MEANS	5.57	5.72	5.80	8.38	9.24	14.39	
Control-girls	5.57		0.15	0.23	2.81	3.67	8.72	R_2 = 2.15
Control-boys				0.08	2.66	3.52	8.57	R_3 = 2.29
Control-mixed					2.58	3.44	8.49	R_4 = 2.37
Exp.-mixed						0.86	5.91	R_5 = 2.42
Exp.-boys							5.05	R_6 = 2.46

Cg Cb Cm Em Eb Eg

Any two treatment means not underscored by the same line are significantly different.

Any two treatment means underscored by the same line are not significantly different.

VIII. C. Summary of Results

An inspection of the various analyses presented in Tables 1 - 4 reveals that, with one minor exception, all expected outcomes hypothesized in Section VI. C-2. have been observed.

1. The analyses in Tables 1 and 2 demonstrate that the experimental group as a whole made significantly greater gains than their control counterpart in both Science and Language Arts at the .05 and .01 levels respectively.

   Sex type and interaction effects for both Science and Language Arts appear to be non-significant.

2. The results of the application of Duncan's New Multiple Range Test will be discussed for Science and Language Arts separately below.

   a. Science (Mean achievement growth comparisons)
   The Experimental Boys group and the Experimental Girls group did not differ significantly from each other, but did differ significantly from all other groups. There were no significant differences associated with any of the six possible comparisons made between the remaining four groups. (The three control condition groups and the experimental mixed group.)

   b. Language Arts (Mean achievement growth comparisons)

   The data indicates that, contrary to the outcome hypothesized, there was a significant difference between the Experimental Boys and Experimental Girls groups, while no significant difference was found between the experimental Boys and the Experimental Mixed groups. Both Experimental Boys and Experimental Girls groups did, however, differ significantly from each of the three control groups.

IX. DISCUSSION

A. Interpretation of Findings

From the analyses of the data it would appear that grouping for instruction by a student's sex typed interests have a significant effect upon his achievement. In all cases, both of the single sex experimental groups evidenced an average achievement growth in Science and Language Arts that was significantly greater than their control counterparts average achievement growth.

It is interesting to note that one of the basic observations that played a major role in pointing to the need for a closer look at the type of grouping for instruction under study in this investigation (ie - the superiority of boys over girls in Science and girls over boys in Language Arts) was to a degree in evidence within the experimental groups at the conclusion of the study. While both single sex experimental groups were matched prior to treatment on initial levels of achievement in Science and Language Arts, after treatment one observes that boys have made a slightly greater gain than girls in Science and girls have made a statistically significantly greater gain than boys in Language Arts.

From the evidence reported above, one must draw the conclusion that while an educational treatment centered around single sex type grouping and the presentation of special interested oriented materials has a significant effect on the achievement of students when this achievement is compared to the achievement of a same sex type group, the treatment appears to have much less of an effect on compensating for a tendancy for boys to achieve at a higher level than girls in the area of Science and girls to achieve at a higher level in Language Arts.

B. Implications and Recommendations

It is recognized that grouping for instruction by sex type, while apparently effective as a grouping procedure, is merely a means of grouping homogeneously by interests whereby the real heart of the treatment, an interest centered curriculum, can be more effectively and efficiently implemented.

Like most educational treatments, a close inspection of the instructional design reveals a highly organized aspect of a particular process that most educators have long recognized to be "just plain good education", ie - fitting the educational program to the child and not vice-verse. There are numerous educational methods to achieve this end.

IX. B. Implications and Recommendations (cont'd)

The method under study in this report, the utilization of methods and materials reflecting sex typed interests, appears to be just one more effective member of this family of sound educational methods.

Of course, one could not conclude from the results of this study that all classrooms should be organized into same sex types. One should, however, be aware of the effect that an interest centered curriculum can have on achievement and plan his educational strategy accordingly.

X. SUMMARY

The problem under study in this report is that girls tend to do better in Language Arts than boys and boys tend to be more successful in Science than girls. It was hypothesized that a group of children placed into a same sex type classroom whereby an interest centered curriculum could be more effectively and efficiently implemented, would evidence greater gains in achievement in these areas than a set of untreated, matched control groups of children.

An analysis of achievement growth in Science and Language Arts for the six groups under study (an experimental group of all boys, an experimental group of all girls, an experimental mixed group and 3 control groups designed for purposes of comparison with the experimental groups and matched on initial levels of Intelligence, Science achievement and Language Arts Achievement) was made within a 2 x 3 factorial design and a further "all possible comparisons" analysis using Duncan's New Multiple Range Test.

Results of the analysis indicated that:

1. The experimental groups as a whole made significantly greater gains than the control group as a whole, in both areas of achievement.

2. Both the "All Boys" and "All Girls" experimental groups made significantly greater gains than their control counterparts in both areas of achievement.

3. Within the experimental groups, boys made slightly greater gains than girls in Science achievement and girls made statistically significantly greater gains than boys in Language Arts achievement.

From the results of this particular study one would conclude that while the combination of grouping for instruction by sex type and the presentation of interest centered material has a significant effect on the achievement of the children involved when comparisons are made with sex type held constant, it has less effect on compensating for the tendancy for boys to still achieve at a higher level than girls in Science and girls to achieve at a higher level than boys in Language Arts.

Appendix A-1a

SCIENCE OBJECTIVES - ALL BOYS EXPERIMENTAL CLASS

1. Offer subjects of special interest to boys such as

   Weather and Weather Instruments

   Evergreens

   Light

   Introduction to Chemistry

   Heat

2. Study only the subtopics of the above main topics that provide for an activity program.

3. Structure groupings in 2's or 3's so that less able students are paired with more able.

4. Introduce the scientific method to students by providing situations for its use.

Science Program

I. Weather instruments made (About 10 weeks)

   A. Hygroscopes

   B. Hygrometers

   C. Thermometers - Wet and Dry Bulb

   D. Barometers

   E. Anemometers

Special Note:

The most accurate instruments were chosen for use in our weather station. Two complete stations were assembled. Observations and predictions were made.

II. Evergreen Unit - (About 4 weeks)

   A. Observe

   B. Identify

   C. Classify

Appendix A-1a (cont'd)

III. Light (About 8 weeks)

A. Kinds of light

B. Reflected light

C. Refracted light

D. The Eye

Special Whole Class Construction Projects

A. Periscopes

B. Camera Obscuras

C. Some Kaleidescopes

IV. Introduction to Chemistry

A. Define Chemistry

B. Three States of Matter

C. Structure of Atom

D. Chemical Change

E. Nature and Demonstration of Physical Change

F. Define Demonstration versus Experiment

G. Conduct experiment on rate of evaporation of liquids - use 24 different liquids - observe rate of evaporation - conclude which evaporates faster.

V. Heat

A. Transmission

Used bimettalic bar, conductometers - homemade.

B. Conduction

Used demonstration thermostat, Centigrade and Fahrenheit thermometers.

C. Convection

Used convection boxes

D. Radiation

Appendix A-1b

LANGUAGE ARTS - ALL BOYS EXPERIMENTAL GROUP

I. Creative Writing Unit (About 6 weeks)

A. Tall Tales Unit based on boy's love of exaggeration.

1. Create tall tale character.
or
2. Create tall tale plot.
or
3. Create tall tale character and plot.

B. Teach editing skills - each pt. below a class lesson.

1. Get ideas on paper.

2. Check sentence structure.

3. Check spelling.

4. Check punctuation.

5. How to write a good title.

6. Rewrite in ink.

C. Help to illustrate stories creatively

1. Illustrate title.

2. Illustrate an exciting story incident.

II. Interviewing as a class (About 3 weeks)

Subject - Rick Cassata - Syracuse University football star.

A. Procedure

1. Letter of Invitation

a. Best edited letters sent - 8

2. Predebating Preparation

a. Questions submitted by each boy in 3 categories - early life before college - college career - after college.

b. Committee of 3 boys met to decide who would ask an interesting question and eliminate duplication.

c. Ditto questions - each boy receives copy.

II. A. Procedure (cont'd)

3. The debate

a. Chairman introduces speaker.

b. Technician records debate.

c. Class writes interview notes on ditto paper.

4. Post debate

a. Check facts on ditto sheet against tape for accuracy.

b. Write individual interviews in final form using 6 step editorial procedure from creative writing unit.

c. Write thank you letters - send best edited - 12 this time.

d. Interview composite appeared in school newspaper.

III. Christmas Program (About 3 weeks)

Subject - Christmas Presents in the Future

A. Procedure

1. Each boy made needed product.

2. Each product was accompanied with an appropriate label bearing product's name, patent number, manufacturing company name - suggested price and directions for using plus guarantee.

3. A tag told for whom in CR I or CR II the present was intended.

B. The Program

1. The class room's folding doors opened showing the class supposedly busily at work in Santa's workshop. Santa enters and hopes products are ready for Christmas. Next, Santa calls his elves on Christmas to help distribute gifts. Students are called to receive gifts. Much hilarity results from gifts matched to certain students.

IV. Language Arts Survey (1 class period)*1

A. Objectives:

1. To plan, with the boy's help a program based on their suggestions, for the rest of the year.

2. To get the reactions of the boys to the "all male" grouping.

*1See copy of survey for results.

V. Second Interview (4 weeks)

In response to the survey's demand for more interviewing it was decided by the class to interview Mr. Arnie Burdick, Executive Sports Editor of the Syracuse Herald Journal.

The same steps were followed for pre-interviewing, interviewing and post-interviewing as for the Cassata Interview.

VI. Creative Writing and Illustrating (5 weeks)

A. Create a personality from an inanimate object connected with the sports world or any inanimate object of interest.

1. A football's point of view during a game.

2. A basketball that couldn't quite make baskets.

3. A hockey stick, etc.

4. The rest was left to the boy's imagination.

B. Editing skills strengthened

1. Same 6 points as stressed in interviewing.

C. Illustrating skill strengthened

1. Story written on picture of the kind of sports equipment used.

VII. Debating - (About 4 weeks)

A. Taking a cue from our survey, the class decided on the following topics -

1. Project work has value for 10 and 11 year olds.

2. 10 and 11 year olds are too young to play organized football.

3. Fighting among 10 and 11 year olds solves no problems.

4. Lunches should have choices.

5. Television programs as a whole are not educational or even entertaining from a 10 or 11 year olds point of view.

6. Detention has little value.

7. Most movies 10 and 11 year olds see do more harm than good.

VIII. Panel Discussion - (About 3 weeks)

A panel discussion which provides for audience participation seemed inevitable.

A. Topics

1. 1-4 on attached sheet.

5. Others suggested by class.

B. Procedure

1. Five teams of 4 each.

2. One chairman for each team.

3. Time limit - 25 minutes.

IX. Story Filmstrip - (3 weeks)

Outgrowth of inability to buy specific filmstrip wanted on how to write a story.

A. Title "Aw, I Can't Write" featuring Quem (a question mark boy who says he can't write and Writo a boy who can)

B. Procedure

1. After much discussion, 20 scenes were decided upon.

2. These were drawn and printed on 12 x 18 paper and photographed sideway - 2 to a frame.

3. 5 frames were used as before and after leaders.

4. Quem and Writo were designed.

5. Class divided into printers and drawers.

6. Pictures mounted and photographed 2 at a time.

X. Creative Writing (5 weeks)

Five minute play situations from our survey were decided upon.

Appendix A-1c

ALL BOYS EXPERIMENTAL GROUP

LANGUAGE ARTS SURVEY - 24 participating

1. I (do - don't) like all boys in my Language Arts Class because

   do 14 don't 10 no reason 1 See Appendix 1d.

2. I participate (more- less) in language arts class discussion this year because

   More 19 Less 5 See Appendix 1d.

3. Underline as many as you wish.
   I find writing hard work, interesting, easy, boring because

   Hard work 4 Interesting 20 See Appendix 1d.
   Easy 4 Boring 3

4. Underline one
   I find writing this year is improving - yes, no, sometimes.

   Yes 11 No comment 3 Sometimes 10

5. My favorite topics are _____

6. Place a (X) by as many as you wish. (X) those that especially appeal to you. In the next term I would like to do---

Write my autobiography	7	Build a story to a climax, let someone else finish	6
More interviewing	13	Write a review of some television program	7
Write poetry	4	My Moments - embarrassing, surprising, happy, first haircut, first pair of roller skates, etc.	8
Write 5 minute plays	19	If I Were-the first man on the moon, president of the U.S., principal of my school, etc.	14
Have a panel discussion	13	The First Wheel, The First Pin, The First Shoe, Etc.	12
Have a debate	18	Create a character, and write a series of stories about him.	13
Make filmstrips on Writing Helps for Other Boys	6		
Do more creative writing to include:			
Write my autobiography	7		

Appendix A-1d

DOCUMENTATION OF NON-CLASSIFIABLE RESPONSES TO LANGUAGE ARTS SURVEY

1. Reasons for liking

1. Boys are more interesting (2)
2. It's fun (2)
3. All nice, friendly guys (3)
4. Girls get in your hair
5. I like boys
6. Boys have more participation (2)
7. No girls to slow us down. (2)
8. We can work together better

Not Liking

1. Boys don't get things in on time (2)
2. Some boys hog everything we do (3)
3. Some boys are mean and selfish (2)
4. Some boys don't like me.

2. Reasons for <u>more</u> participation

1. I learn a lot (2)
2. Interesting (12)
3. No Language Arts in other schools (1)
4. Boys have a chance to speak
5. More fun (2)
6. No girls

Less participation

1. I do not work (1)
2. It is not that much interesting (1)
3. I keep on forgetting things (1)
4. I don't like what we are doing sometimes (1)
5. I'm not used to the new work (1)

3. Interesting <u>reasons</u>

1. Good things to write about
2. More fun
3. You get into things you don't understand and find out
4. I enjoy writing

<u>Hard Work</u>

1. I can't think of what to write
2. Everytime I do something, I goof it up
3. I can't write what I like in a story
4. It is hard to say something

4. <u>Boring Reasons</u>

I don't really have much to write about.
We can learn more by talking.

Appendix A-2a

SCIENCE UNITS - ALL GIRLS EXPERIMENTAL GROUP

A. Weather Unit 19-45 minute periods

1. Water cycle
2. Water conservation
3. Forms of precipitation
4. Clouds (formation, types)
5. Atmosphere
6. Weather Maps
7. Weather instruments
   a. Uses
   b. Construction of
8. Recording of daily weather conditions

B. Evergreens 6-45 minute periods

1. Speaker - Dr. Miller (School of Forestry)
2. New York State evergreens (stressed)
   a. Specimen identification
   b. Specimen comparison
3. Uses of evergreens

C. Light 16-45 minute periods

1. Energy
2. Properties of light
3. Uses of light
4. Sources of light
5. Colors (prisms)
6. Optical illusions

D. Heat 12-45 minute periods

1. Sources of heat
2. Uses of heat
3. Expansion
4. Conduction
5. Convection
6. Radiation
7. Measurement of heat (F. & C.)

E. Soil 10-45 minute periods

1. Properties
2. Uses
3. Types
4. Soil testing
5. Soil Conservation

Appendix A-2b

LANGUAGE ARTS - ALL GIRLS EXPERIMENTAL GROUP

A. Creative Writing

1. The Green Spaceship Lands (Illustrated)
2. Gus Learns to Fly
3. Mr. Smith's Problem
4. Halloween Stories (written for primary school children)
5. Explain to their mothers why they need a baby elephant

B. Character Presentation

1. Develop a character
2. Present to class using visual props

C. Product

1. Create a product (shampoo, gum, soap, etc.)
2. Sell to the class (t.v. commercial, song, skit)

D. Letter Writing

1. Write a letter to Santa
2. Use an imaginary person and request something from Santa
3. Mrs. Santa (child in the class) read these letters on her t.v. show

E. Play

1. Class decided upon a "comedy mystery"
2. Girls wrote the script
3. Girls designed scenery, and played the music
4. Girls produced the play
5. Presented to other fifth grades

F. Final Activity (Individual Choice)

1. Book
2. Skit
3. Poetry

Appendix A-3a

SCIENCE - MIXED EXPERIMENTAL GROUP

Subject Matter	Class Periods
WEATHER	20
Water Cycle	2
Forms of Precipitation	3
Atmosphere	2
Clouds	3
Signs of Weather	3
Weather Instruments	3
Thunder and Lightning	1
Water (properties)	2
Weather Maps	1
EVERGREENS	8
Film and Speaker	1
Specimens and Identification	3
Comparisons of needles and cones	3
Uses of Evergreens	1
LIGHT	16
Forms of Energy	2
Theories of Light	1
Properties of Light	2
Reflection	1
Refraction	1
Color	5
Lenses	1
The Eye	1
Optical Illusions	2

SCIENCE - MIXED EXPERIMENTAL GROUP (cont'd)

Subject Matter	Class Periods
HEAT	**18**
Sources of Heat	1
Theories of Heat	1
States of Matter	2
Temperature (Fahrenheit and Centigrade)	1
Expansion and Contraction of Matter	3
Conduction, Convection, and Radiation	2
Friction	1
Heat Capacity	1
Measuring Heat	1
Research	4
Fuels	1
SOIL	**11**
What is Soil?	2
Types of Soil	1
Soil Testing	1
Animals and Plants in Soil	1
Minerals in Soil	1
Characteristics of Soil	1
Soil Conservation	2

Appendix A-3b

LANGUAGE ARTS - MIXED EXPERIMENTAL GROUP

In Language Arts I devoted approximately 70% of class time to writing. Included under this category are all types of creative writing. The children wrote stories containing three unrelated words, tall tales, stories built around plot situations and characters, and stories which contained either a given first or last sentence or title. They also did some functional writing and letter writing.

Class periods were not only spent doing the actual writing of the material, but also editing skills were woven in. Skills, such as sentence structure and paragraphing, as well as grammar and language usage were stressed throughout the year.

One highlight of the year was our Charlie Brown Christmas play. The students wrote, produced, directed, made costumes and scenery and presented this original play to an all-school audience. Approximately fifteen class periods were devoted to this project.

Another special project was our dramatized biographies. Each child read a biography or autobiography of a famous person. He then prepared a five minute speech, protraying the individual whom he read about, in costume, telling why he should be elected to our hypothetical Hall of Fame. Five students were elected to the Hall of Fame and were presented trophies bearing the name of the individual portrayed.

Still another special event in our class grew out of a field trip which the group took to a local television station. When we returned to the classroom, the children broke up into groups of five and wrote their own original forty-five minute long TV programs, including commercials, costumes, and props. These were presented to the other fifth grade classrooms.

Appendix B-1

DATA FROM PRE-TEST MATCHING

	Science Achievem't.		Language Achievem't.		Intelligence	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Exp. Boys	6.61	1.66	5.91	0.93	114.27	17.67
Exp. Girls	6.62	1.56	5.89	0.86	113.67	13.29
Exp. Mixed	6.63	1.66	5.91	1.08	114.27	15.71
Control Boys	6.65	1.22	5.90	0.93	113.87	9.81
Control Girls	6.64	2.18	5.90	1.31	114.27	10.13
Control Mixed	6.69	1.81	5.91	1.26	113.93	10.05

Appendix C-1

SUMMARY OF RESULTS

An inspection of the various analyses presented in Tables 1 - 4 reveals that, with one minor exception, all expected outcomes hypothesized in Section VI. C-2. have been observed.

1. The analyses in Tables 1 and 2 demonstrate that the experimental group as a whole made significantly greater gains than their control counterpart in both Science and Language Arts at the .05 and .01 levels respectively.

   Sex type and interaction effects for both Science and Language Arts appear to be non-significant.

2. The results of the application of Duncan's New Multiple Range Test will be discussed for Science and Language Arts separately below.

   a. Science (Mean achievement growth comparisons)
   The Experimental Boys group and the Experimental Girls group did not differ significantly from each other, but did differ significantly from all other groups. There were no significant differences associated with any of the six possible comparisons made between the remaining four groups. (The three control condition groups and the experimental mixed group.)

   b. Language Arts (Mean achievement growth comparisons)
   The data indicates that, contrary to the outcome hypothesized, there was a significant difference between the Experimental Boys and Experimental Girls groups, while no significant difference was found between the experimental Boys and the Experimental Mixed groups. Both Experimental Boys and Experimental Girls groups did, however, differ significantly from each of the three control groups.